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Identifying the Impact Factors on the Land Market in Nepal from Land Use Regulation

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Abstract: Measuring the impact of land use regulation on the land market involves identifying and classifying relevant impact factors related to the land market. The objective of this study was to identify land market impact factors in the context of the introduction of land use regulation in Nepal. A desktop review was carried out to identify preliminary set of impact factors, which were reclassified through intuitive analysis based on the degree of thematic closeness. Perspective-based impact factors were identified through the qualitative analysis of primary data collected through semi-structured interviews with the Nepalese land market stakeholders. These independently derived impact factors were compared with the desktop literature review impact factors resulting in fourteen land market impact factors across four dimensions, including transaction cost, valuation, mortgage availability, taxation, and compensation across the economic dimension; lot size, subdivision restrictions, and coordination across the institutional dimension; awareness, expectation and proximity across the social dimension; and risk reduction, quality of residential land, and suitability of zoning classification across the environmental dimension. There was significant overlap and commonality across factors identified from both the literature review and semi-structured interviews. The land market impact factors determined in the study may be adapted and generalized across other countries and could be utilized to better understand the impacts of land policy decisions on urban planning and development. Further research is recommended on the process to operationalize the use of these factors to quantify the impact of land use regulation on different land markets.

Keywords: desktop review; land use regulation; land market; stakeholders; qualitative data analysis; impact factors

1. Introduction

Efficient management of land use and well-functioning land markets form the cornerstone of sustainable development. Achieving sustainable use of land resources entails evaluating economic, social, environmental, and institutional factors. Consequently, assessing the effects of land use regulations on the land market from various perspectives can aid decision-making and promote sustainable land management approaches [1–3]. The measurement of the impact of land use regulation on the land market is a complex process and requires a thorough examination of associated impact factors across a variety of dimensions [4]. This paper offers a comprehensive exploration of the relationship between land use and land markets, drawing from various literature sources and local stakeholders' insights in Nepal. By synthesising information from both literature and on-the-ground insights, this research explores the land market impact factors in the context of Nepal.

A land market is a complex system of processes where several actors, such as landowners and buyers, financial institutions, land developers and their professional organizations, and land administration authorities interact at different levels to achieve a market outcome [5]. A large body of literature has addressed the multifaceted nature of land market dynamics and the diverse impacts of land policy interventions across different countries [5–11]. Countries that have regulated land use

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have experienced the impact of this regulation across multiple dimensions of their land markets. Examples from India [12], the UK [13,14], Brazil [15], and Japan [16] demonstrate the wide-ranging effects of land use regulations, particularly on transaction costs, housing affordability, land supply, and property values. In Nepal, the restriction of fragmentation of agricultural land through enforced agricultural classification nationwide [17] had significant impact on landowners and stakeholders across the country, leading to widespread dissatisfaction and even litigation against the government's policy [18,19].

However, the adverse effects of uncontrolled land use and development have necessitated governments to implement measures to regulate land use and land planning in many countries. Government intervention in the land market often involves the introduction of land use regulations aimed at mitigating negative outcomes such as environmental degradation, food insecurity, and poorly planned development [8]. However, any interventions can change the behaviour of the land market and lead to outcomes that affect many stakeholders. It is, therefore, important to minimize the unforeseen impacts of well-intentioned land use regulations and policies on the land market [20]. Measuring the impact of land use regulation on the land market helps to identify areas within the land market that need to be prioritized.

A review of literature on the impact of policy interventions on land markets can provide a generalized understanding of the impacts of policy interventions on the land market. However, it is important to recognize that the findings from such studies may not be directly extrapolated to land markets in different jurisdictions as each land market is unique in characteristics and is a function of institutional, socio-cultural and legal settings [21]. A land market is dynamic, relative, and contextual, and consequently, the impact outcome varies across jurisdictions and cannot be generalized [5]. A land market outcome can be positive for a particular group of stakeholders; however, it can be negative for others. This implies that multiple perspectives are required to holistically measure the impact of land use regulation on the land market. There have been limited studies that have investigated land use regulation and its impact across multiple dimensions of the land market [6,22]. This study aims to explore and understand the land market impact factors in the context of the recent introduction of land use regulation in Nepal.

This paper firstly presents the land use-land market situation in Nepal in the Section 2 including the concept of the land use-land market relationship. Section 3 discusses the research methods adopted to identify land market impact factors through the application of a desktop literature review and subsequent stakeholder interviews. Section 4 describes the comparative analysis of both the desktop review and interviews to arrive at a set of refined impact factors. The results are then discussed, and final conclusions are drawn.

2. Literature Review

2.1. Nepalese Land Use Situation

Recent land classification in Nepal dates back to the land reform program of 1963, which established the land registration system using cadastral surveying and the management of land records at district land revenue and survey offices [23]. The cadastral surveying, initiated in 1964 under the Land Survey and Measurement Act, classified land based on the productivity of food crops into four grades: Abal (first grade), Doyam (second grade), Sim (third grade), and Chahar (fourth grade) [23,24]. However, this legislation did not address land suitability for non-agricultural purposes such as residential, commercial, or industrial use. The introduction of the National Land Use Policy in 2012 and its amendment in 2015 aimed to address concerns regarding food security and environmental degradation [25–27]. This policy was followed by the implementation of restrictions on the subdivision of agricultural land in 2017 [17] and the enactment of the Land Use Act 2019 and Land Use Regulations 2022 [28,29], further reinforcing land use regulation in the country.

The limited agriculture-based land classification in Nepal failed to address critical issues such as land fragmentation and haphazard land development driven by rapid population growth and internal migration from rural to urban areas [30,31]. This led to concerns about the loss of agricultural

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land, food security, congested urban settlements, lack of open space, and environmental degradation [25,32]. In response, the Nepalese government introduced the National Land Use Policy in 2012, to control haphazard land use development. However, after the 2015 earthquake in Nepal, the focus shifted to resettlement programs, prompting the replacement of the policy with a revised Land Use Policy in 2015. This updated policy expanded land classification to eleven zones, mandated hazard area delineation, and specified land use implementation strategies. Political priorities delayed the enactment of land use controls [33] and resulted in the exacerbating of agricultural land fragmentation [30]. In response, a ministerial decree was issued in 2017 [17] to enforce the restriction on the subdivision of agricultural land nationwide, leading to dissatisfaction among real estate agents and private land developers. However, the High Court upheld the government's decision [19] and directed the continuation of restrictions until the enactment of a land use act. Subsequently, the Land Use Act 2019 was introduced, mandating that local governments designate land classifications prior to land transactions [28]. The implementation of land use regulation has been closely monitored by key stakeholders in the land market, as well as academics and researchers [18,27,29,30,34,35].

2.2. Land Market - Land Use Relationship in Nepal

A land market involves a multifaceted network of interactions involving various participants such as landowners, buyers, financial institutions, land developers, professional organizations, and land administration authorities, all working together across different levels to establish market dynamics [5]. The land market in Nepal aligns with Dale and Baldwin's [36] three-pillar model, which encompasses land registry services, financial services, land valuation services, and the involvement of key stakeholders as fundamental elements shaping the market (see Figure 1).

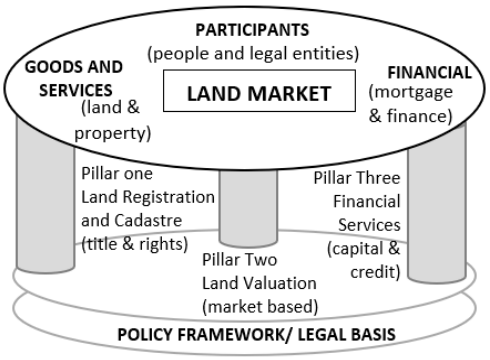

Figure 1. Three pillar land market model of Dale and McLaughlin [37].

In Nepal, the land transaction processes involve various stakeholders who engage through the district land revenue and survey offices dispersed throughout the nation. With over 25 million land parcels documented in these offices countrywide [38], they serve as pivotal hubs for coordinating land valuation activities mandated by the Land Revenue Act [39]. These offices also provide land records to their customers such as landowners, notaries, financial institutions, land developers, and real estate offices. Nepal has over 11,000 branches of banks and financial institutions [40], providing credit services to the landowners where land properties serve as collateral [41,42]. The collaborative ecosystem comprising various organizations, institutions and customers facilitates the transfer of land rights throughout the transactional process [23,24]. The legal framework underpinning the Nepalese land market primarily comprises the Land Revenue Act [41], the Land Act [43] and the Land Survey and Measurement Act [44]. Nevertheless, the emergence of the Land Use Act 2019 [28] and Land Use Regulations 2022 [29] alongside the enforcement of land use policies has begun to influence various dimensions of the land market.

The economic dimension of the land market impact can be represented through economic models that assess land value by considering various factors, including legal and political, economic, environmental, social, urban, public interest, and demographic considerations [45]. Economic factors

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such as commodity value, quantity, or price are influenced by buyer and seller behaviour [46] and are influencers of the land market [7,9,47–55]. Land use planning, at times, has led to delays in land development resulting in shortage of land and space for residential and commercial purposes, impacting not only the housing market but also the broader economy [14,22]. Economic factors influencing the land market due to the introduction of zoning or related restrictions include transaction costs [21], the balance of demand and supply of land [6], taxation based on permitted use [56], availability of mortgage financing [8,21], compensation mechanisms [21,57], and, notably, land speculation [58,59].

The social dimension of land policy decisions relates to how well land policies align with public expectations. Introducing a new land administration or management system, as argued by Tuladhar and van der Molen [60], can lead to service delivery delays until participants become familiar with the system. Dowall [6] suggested that land use regulation can cause procedural delays and bureaucratic hurdles, while Mayer and Somerville [61] highlighted delays in development processes due to land use regulations. In Nepal, the land use directives introduced by the then Ministry of Land Reform and Management (MOLRM) in 2013 required a field verification process to determine land categories [62]. This step adds additional time to the transaction process. Moreover, restrictions on the periodic subdivision of agricultural land, implemented by the Government of Nepal in 2017, introduced further delays as surveyors were required to verify whether a land parcel qualifies for subdivision [17]. Additionally, Nepal's land use policy lacks specification for mixed land use zones, contrary to common urban land use [63], often then failing to meet public expectations. Schirmer [64] identified issues related to land availability, employment, and identity as part of the socio-economic impacts of land use change. In Nepal, the designation of a land use class on the land already purchased for a different purpose has raised concerns regarding economic loss and fairness of the process [19]. Loxton, et al. [65] argued that individual social impacts resulting from policy changes and interventions interact and aggregate into cumulative social impacts.

The environmental dimension of the land market's impact can lead to either positive or negative changes in the land market in relation to the land use changes. For instance, road expansion in Kathmandu has improved traffic flow and increased open spaces, yet it has also contributed to noise and air pollution along major roadways [66]. Residential land development standards necessitate the establishment of open spaces, roads, and utility services before land is brought into the land market. Residential plots with improved quality attract higher demand compared to unplanned developments [67]. Land use planning, as argued by Burby and Dalton [68], restricts land availability for development by demarcating hazard-prone areas. A study conducted by the National Planning Commission assessing integrated settlement development feasibility in Bajura, a hilly district in Nepal, found that 90% of the area was unsuitable for residential development [69,70], prompting calls for relocating people from vulnerable zones. The designation of risk areas also causes changes in potential buyers' preferences in the land market, with reduced interest in investing in high-risk zones.

The institutional dimension of the land market encompasses problems stemming from inefficient regulation implementation or additional institutional barriers during land use regulation implementation. New legislation should not introduce further risk to land use or land ownership rights [71]. One of the most contentious issues in the land use-land market relationship is land rights [8]. Inadequate attention to land rights during land use implementation often leads to complaints, legal disputes, and conflicts [72,73]. The success of land use planning implementation hinges on the understanding of two parties: the implementing authorities and the public. Implementing authorities require clarity on the implementation process and must inform the public about restrictions, while the public needs to recognize their responsibilities regarding land use. For instance, the lack of coordination between the government and land market stakeholders before imposing subdivision restrictions in Nepal led to conflicts and protests [17,19]. Affected landowners perceived the subdivision restriction as a violation of their fundamental property rights [17,18]. Similarly, the implementation of the Guided Land Development Project (GLDP) in Kathmandu failed to pay compensation to the landowners for the land acquired for road expansion, prompting protests and

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legal action [74,75]. Poor coordination, another institutional factor, leads to a lack of sharing information and experiences, creating gaps which are not addressed by any party [76].

Literature underscores that effective land use management and efficient land markets are foundational prerequisites for achieving sustainable development [1]. However, 'land use' and the 'land market' share a reciprocal relationship, with the former often regulating land use rights while the latter promotes freedom in land use [8,73]. In general, two overarching institutional issues regarding rights are prominent: the right to live in a safe environment without being adversely affected by others' actions, and the right to dispose of property at one's discretion [18,77]. The implementation of land use regulations can also impact other aspects such as changes in actors' behavior [5], and organizational business processes [36]. Thus, the effects of land use regulation on the land market extend beyond the economic dimension but influence the social, institutional, and environmental dimensions. Research adopting an integrated approach to consider these various dimensions of the land market is lacking. Therefore, an integrated assessment framework that incorporates various impact factors across multiple dimensions is proposed. Such a framework would facilitate the identification of the impacts of the introduction of land use regulation on the land market.

3. Materials and Methods

3.1. Description of the Research Approach

Various research approaches were identified on the evaluation of the impact of land use regulation on the land market, including the use of quantitative methods by Lees [9], Lees [78]; and qualitative approaches adopted by Needham, Segeren and Buitelaar [5] to identify land market outcomes. However, research can also be undertaken by relating and synthesizing the existing knowledge regardless of discipline [79]. A desktop review of literature enables the integration of multiple research outcomes to understand the available evidence at a meta-level and helps to identify the areas requiring further research. It also enables the development of theoretical frameworks and conceptual models [80] to advance progress in this field. In this study, we adopted a two-step approach to determine the associated impact factors for the Nepalese land market. Firstly, a desktop study was performed to identify the preliminary set of the land market impact factors. We then utilized semi-structured interviews with stakeholders to refine the pre-identified preliminary land market impact factors in the context of the Nepalese land market. The research approach is summarized in Figure 2.

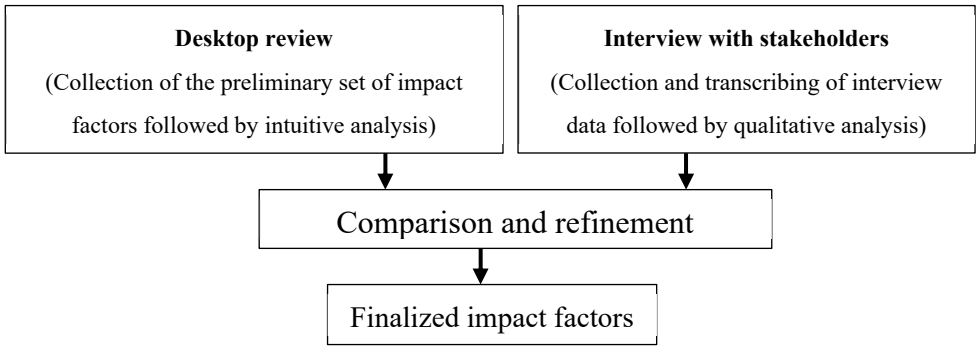

Figure 2. Research approach.

3.2. Desktop review

The desktop review was selected for the identification of land market impact factors associated with land markets for two reasons. Firstly, it provided a comprehensive breadth of knowledge of possible land market impact factors across multiple jurisdictions and secondly it was a low-cost approach in identifying the land market impact factors at the preliminary phase of the research [79].

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The desktop literature review was not limited to the journals and included conference proceedings, international guidelines, professional reports, government policy documents, working papers and discussion papers with the expectation of finding any relevant studies on the impact factors of land use on the land market or its components. Platforms such as Web of Science and library databases identified a limited number of peer-reviewed articles. In comparison Google Scholar provided links to a diverse and larger set of publications, including published articles, preprints, theses, books, and court opinions. An internet search using the Google search engine with keyword searches in single and combined forms such as land market, land market impact assessment, impact of land zoning on land market, and land use on land market were used to identify relevant articles. The output of the searches was reviewed, which led to the elimination of many of the articles and provided a list of preliminary selected articles. This was followed by a review of the articles' key words, abstract, summary, introduction and conclusion, which led to filtering out a list of selected articles for in-depth study. Table 1 shows the search statistics of the articles collected for the preliminary study.

Table 1. Selection of articles for identification of land market impact factors.

SN	Articles	Initially collected	Dropped	Selected articles for in-depth study
1	Journal based	70	46	24
2	Conference proceedings/ Conference paper	27	21	6
3	Report and guidelines from government authorities and global financial and welfare organizations	17	12	5
4	Books /book section	8	5	3
5	Others (Magazine articles, guidelines, thesis, unpublished articles	17	12	5
	Total	139	96	43

The preliminary study helped to select articles for in-depth study of their content to identify land market impact factors. Based on the degree of similarity of the impact factors across and their re-interpretation, they were re-classified and categorized into social, economic, institutional, and environmental dimensions. The application of the desktop review provided a list of the preliminary impact factors. The final refinement was undertaken during interview with stakeholders.

3.3. Interview Data Collection in Nepal

The Kathmandu Valley in Nepal was chosen as the study area for this research due to its significance as a representative case in regard to recent land use regulation. Encompassing the districts of Kathmandu, Bhaktapur, and Lalitpur (Figure 3), along with 19 local administrative units, it presents a diverse urban environment. With a population of approximately three million as of 2021, it ranks as the most densely populated region in Nepal [81]. The land administration infrastructure in the study area includes nine land revenue and cadastral survey offices that facilitate land transactions for approximately 1.5 million registered landowners [82]. Additionally, the Kathmandu Valley holds considerable economic importance within Nepal, hosting 23% of the nation's financial institutions [83] and contributing significantly to the country's economic activity, accounting for roughly one-third of its total output [84]. Furthermore, key governmental bodies, ministries, departments, land professional organizations, and private land development agencies are concentrated within this study area.

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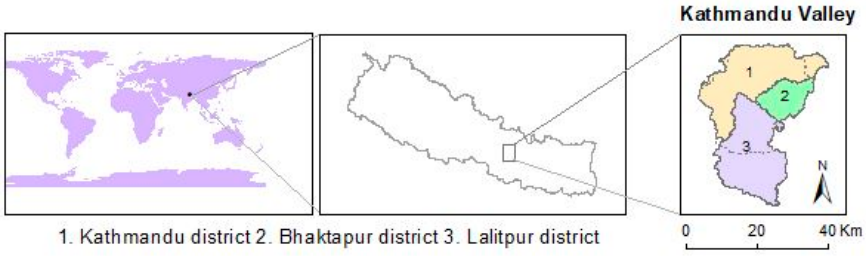

Figure 3. Study area.

For the second stage of this study, we employed semi-structured interviews as our primary method for gathering qualitative data. Before commencing fieldwork, we obtained ethical clearance through the University of Southern Queensland, ensuring that our research adhered to ethical guidelines. The semi-structured interviews were guided by the findings from the desktop review and the preliminary impact factors. However, these interviews provided stakeholders an opportunity to offer further insights into their experiences regarding the impact of land use regulation.

The data collection phase was undertaken from June to August 2018 and included detailed fieldwork across the study area. The stakeholders included individuals, groups, and organizations involved in land market processes [21]. The study identified potential interview respondents through employing a purposive sampling method. This approach involved initially identifying relevant organizations, reaching out to their executives, identifying suitable participants within these organizations, and subsequently recruiting them into the data collection process. Three main groups were identified: private and professional, institutional, and financial. Participants were selected based on their roles and positions within their respective groups. Minimum criteria were set for each group to ensure the inclusion of knowledgeable and relevant individuals. A total of 60 interview participants were selected through purposive sampling, with 20 participants per group. This sampling method ensured representation across the different stakeholder groups. An interview guide consisting of a list of topics covered in the interview was distributed to each participant along with the schedule for the interview. Semi-structured interviews were conducted, focusing on identifying key land market impact factors and perspectives on the impact of land use regulation across economic, social, environmental, and institutional dimensions.

The interviews investigated stakeholders' perspectives on how land use regulation in Nepal had influenced various aspects of the land market, including economic, social, environmental, and institutional dimensions. A total of 14 questions were asked to identify factors and issues affecting the land market due to these regulations. The interviewer began by asking stakeholders about the impacts they had observed, followed by questions into specific areas such as taxation changes, land transaction costs, mortgage availability, and compensation. The social aspects related to land use regulation, including whether the regulations met social expectations and the impact of resettlement programs, were explored next. The environmental impacts were then investigated followed by the institutional arrangements and their effects on the land market. Finally, participants were asked to summarize their overall views on the impact of land use regulation on the land market. Each interview took approximately half an hour. Data was digitally recorded, transcribed, and coded.

3.4. Data Analysis

In the desktop review, the 43 selected papers underwent a thorough examination to identify key terms associated with factors influencing the land market. A compilation of relevant key terms pertaining to the land market was generated. These initially identified key terms were then assessed to determine if they aligned with one of the four dimensions—economic, institutional, social, and environmental— as discussed previously in Section 2.2. Within each dimension, the initially allocated key terms were further scrutinized for similarities, redundancies, and relevance. Terms sharing

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similar meanings were grouped together, while ambiguous or overly general terms were excluded. Subsequently, a final set of literature-based impact factors was established for each dimension.

Qualitative data collected through semi-structured interviews was analysed to identify the perspective-based land market impact factors. Qualitative data analysis forms a systematic analytical protocol that typically involves three sequential activities: data reduction, data display, and conclusion-drawing and verification [85,86]. Data reduction is the process of selecting, analyzing, simplifying, and transforming relevant data from a set of collected raw data. Recorded interviews were first transcribed into text format and saved as individual files, then reviewed and checked for any transcription errors. Data codes were defined based on their thematic alignment to an identified dimension, namely economic, social, environmental or institutional, as indicated by the literature reviewed in Section 2.2 and the preliminarily identified literature-based impact factors. These codes were both single or combinations of words that indicated the changes that occurred in the Nepalese land market as perceived by the participants. Data coding was then performed in the QDA Miner software. The software aided in identifying recurring words and phrases linked to the codes and performed link analysis on the coded data to visualize its clusters.

The clusters of computer-grouped codes within each dimension were examined to ensure they were relevant to their respective dimensions. Codes with similar themes were grouped together and represented with corresponding colors for visualization purposes. A frequency analysis was conducted to determine the prevalence of each code, and the size of each node within a cluster reflected the frequency of coded responses. Recurring codes and their clusters were analyzed further to uncover the underlying impact issues. This qualitative data analysis involved three stages: coding, identifying impact issues, and defining representative themes associated with each cluster. Finally, the results were compared with findings from a desktop review to offer a comprehensive understanding of the impact of land use regulation on the land market.

4. Results

4.1. Identification of Land Market Impact Factors through Desktop Review

The desktop review provided an initial set of land market impact factors/indicators. Although a limited number of studies were identified as relating directly to the measurement of the impact of land use regulation on the land market, many of the variables used in those studies were commonly used in other studies on land use and the land market. Table 2 shows the list of pre-identified impact factors and indicators selected through the desktop review.

Table 2. Key terms related to the land market impact factors initially identified through the desktop review.

Authors	Impact factors/Indicators
Reps and Smith [88]	Subdivision control, supply
Ohls, Weibserg and White [55]	Price, value
Courant [47]	Land price
Shultz and Groy [89]	Subdivision control, supply
Dowall [6]	Supply, price, affordability, sub-division standard, consideration of future requirements (adequacy or suitability of zoning), procedural delays
Burby and Dalton [68]	Hazard, risk, land availability
Dale and McLaughlin [37]	Laws and institutions, financial instruments and services, land recording and valuation agencies, land rights and records, participants
Dale and Baldwin [36]	Credit accessibility, demand, supply, cultural acceptance, transparency, social, environmental and economic sustainability, value for money, tax, transaction cost, openness, accessibility, incentives, clarity, compensation

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Mayer and Somerville [61]	Delay, red tape, transaction cost
Bertaud and Malpezzi [90]	Demand, supply, imposition of higher taxation on consumer
Tuladhar and van der Molen [60]	Transaction cost, coordination, customer satisfaction
Deininger [58]	Credit accessibility, transparency, productivity, desirability, subsidies, transaction cost
Karki [67]	Quality of residential land, supply, open space
UNECE [91]	Taxation, valuation, informal settlement, tenure security, conflict, satisfaction, information availability, transaction cost, transparency, affordability, environmental sustainability
Potsiou [71]	Availability of land information, access to mortgage and credit, security, content, information quality and availability, tax
Jaeger [4]	Value, compensation
Wallace and Williamson [92]	Mortgage, lease, land information, securities, information management and availability, credit facility, ownership, cognitive capacity, land rights, coordination
Dale, Mahoney and McLaren [21]	Credit accessibility, demand, supply, cultural acceptance, transparency, social, environmental and economic sustainability, value, transaction cost, openness, accessibility, incentives, clarity, compensation
Ihlanfeldt [7]	Competitiveness, land price, land value, self-interest, lot size, restriction
Wu [48]	Erosion, desertification, land degradation, conflict, affordability, productivity, pollution, fragmentation, incentives
Cheshire and Vermeulen [93]	Price, cost, benefit
Glaeser and Ward [94]	Demand, supply, price
Williamson, Enemark, Wallace and Rajabifard [8]	Mortgage, lease, land information, securities, information management, credit facility, ownership, expectations, land rights, coordination, information availability, taxation, compensation
Needham, Segeren and Buitelaar [5]	Transaction cost, expectations, prevalence laws, hope value
Ciaian, Kancs, Swinnen, Van Herck and Vranken [49]	Land price, value
Monkkonen and Ronconi [50]	Land price
Loxton, Schirmer and Kanowski [65]	Distrust, injustice, stress, dissatisfaction
Woestenburg [53]	Land value
Alexander [51]	Land price
Luca [52]	Land price, transaction volume
El-Barmelgy, Shalaby, Nassar and Ali [45]	Proximity, social acceptance, price, demand, supply, land values, public interest, hazards
Copenheaver, et al. [95]	Land price, value
Mangioni [57]	Compensation
Schirmer [64]	Employment, identity, land availability
Lodin, Sonila and Onsrud [76]	Coordination, local ownership, information technology
Government of Nepal [26]	Value, tax, subsidies, compensation, conflict, coordination, fragmentation, disaster, risk, lot size
Dirgasova, Bandlerova and Lazikova [54]	Land price, lot size

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Lees [78]	Housing prices, affordability, supply, demand
Cheshire [14]	Value, housing price, transaction delay
Faust, et al. [96]	Quality plots, open space, relocation of informal settlements, value, price, inadequate planning, affordability, data sharing, compensation, ad-hoc planning decisions
Jalali, MacDonald, Fini and Shi [10]	Price, lot size, building density, urban growth boundary
Nakajima and Takano [16]	Price, building heights
Wen, et al. [97]	Price, supply, demand

Some of the key terms identified in the desktop review had similar meanings despite differing terminology, whilst others were used interchangeably. To arrive at a standard set of impact factors, those key terms presented in Table 2 were reclassified, rationalized and then allocated to the economic, environmental, social, and institutional dimensions based on their degree of closeness to those dimensions.

Across the economic dimension, redundancies were noted, such as variations like land price, land value, land affordability, or simply land valuation. To streamline these, we consolidated them under the impact factor 'value' to encompass all aspects related to land price. Additionally, terms like supply and demand were recurrent alongside price across multiple literature sources. Recognizing that land price is influenced by both supply and demand, we substituted these terms with 'value'. Similarly, terms relating to access to mortgage and credit, security, securities, credit facility, credit accessibility, or the presence of financial instruments and services were identified. These were unified under the impact factor 'Mortgage availability'. Moreover, terms like 'incentives' or 'subsidies' were akin to compensation in the context of this study and were consequently represented by the impact factor 'compensation'. Additionally, two more impact factors, 'taxation' and 'transaction cost', were determined.

Across the social dimension, terms like conflict, distrust, injustice, and dispute were evident, suggesting that land use regulation may lead to dissatisfaction among market participants by not meeting their expectations. These terms were reclassified as the impact factor 'expectation'. Likewise, impact factors such as 'willingness', 'acceptance', and 'proximity' were recognized. However, the term 'cognitive capacity' was omitted from consideration as a factor influencing the land market.

In the institutional context, terms such as tenure security, land accessibility, ownership rights, and the presence of legal frameworks pointed towards the significance of 'rights on land' as a crucial impact factor. Additionally, factors associated with the execution of land use regulation included 'subdivision control', 'coordination among participants', and 'lot size'. The concept of 'information availability' or 'information sharing' was seen to be contingent on the level of 'coordination among the land market participants', thus it was not treated as a distinct impact factor to avoid redundant contributions in impact outcomes.

Across the environmental dimension, terms such as 'inadequate planning', 'standard of planning', and 'ad hoc planning decisions' were deemed redundant within the scope of this study. Consequently, they were substituted with the factor 'suitability of zoning classification'. Similarly, terms such as 'hazard, risk, disaster, desertification, erosion, land degradation, pollution' were reclassified as the impact factor 'risk reduction'. Another impact factor identified was the 'quality of residential land' by consolidating the terms 'quality plots' and 'open space'.

The concepts of environmental sustainability, economic sustainability, and social sustainability were viewed as encompassing broader ideas but were ultimately excluded from being categorized as specific impact factors. Nevertheless, they still signify broader impact areas within their respective dimensions.

The distribution of the reclassified preliminary set of impact factors is shown in Figure 4.

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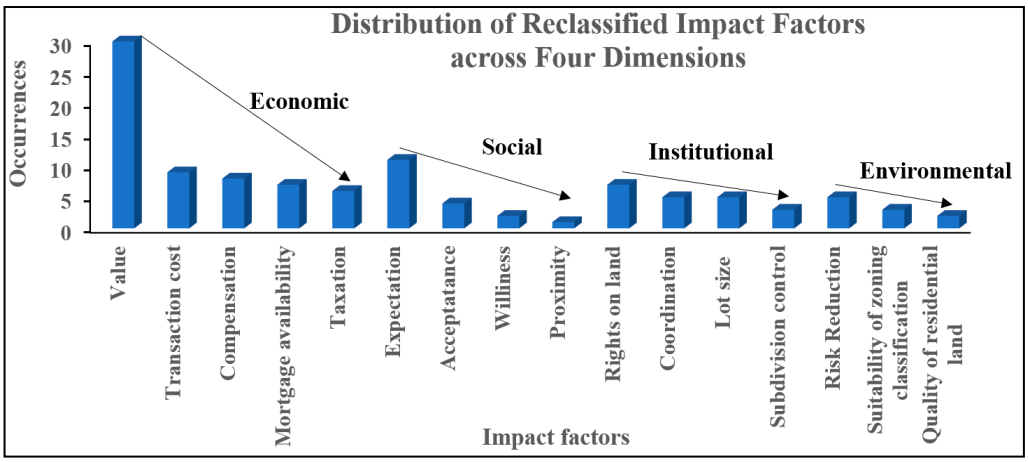

Figure 4. Reclassified impact factors acquired from the desktop review.

As shoen in Figure 4, the desktop review initially identified 16 land market impact factors across all dimensions with varying degrees of occurrence, as shown by the arrows. Land value, transaction cost, mortgage availability, compensation and taxation were identified as the land market impact factors across the economic dimension. Property rights, lot size coordination among stakeholders and subdivision controls were impact factors identified across the institutional dimension. Impact factors such as risk reduction, suitability of zoning classification and the quality of residential land were identified across the environmental dimension. Social expectations, the proximity to the planned location, willingness to support land use implementation, and acceptance of land use planning were found to be impact factors across the social dimension. Of the literature reviewed, impact factors across the economic dimension were rated the highest, with around 56% of total occurrences, whereas those across the environmental dimension were rated lowest, covering about 10% of total occurrences. Impact factors across the institutional and social dimensions had coverages of 20% and 18%, respectively. When compared individually, the maximum occurrence of the reclassified land market impact factors was associated with the 'value' of land, a factor associated with the economic dimension of land market assessment.

4.2. Impact Factors Based on Stakeholder's Perspective

Primary data collected through the interviews was processed in QDA Miner software for descriptive and link analysis. The analysis of interview data showed interrelated clusters of responses across the economic, social, environmental, and institutional dimensions. Respondents indicated that there were changes in land prices or values after the introduction of land use restrictions, particularly as a result of land reclassification and subdivision control. Most of the responses (68%) indicated that prices of residential land had increased, and 23% indicated a reduction in the price of agricultural land in the Kathmandu Valley due to the reduced supply of land caused by land use restrictions.

Across the economic dimension's clusters were found to be related to changes in the land price or value, transaction cost, taxation, mortgage availability and compensation against the loss caused by the implementation of land use regulation. The size of each code is proportional to the volume of responses provided by the respondents (Figure 5).

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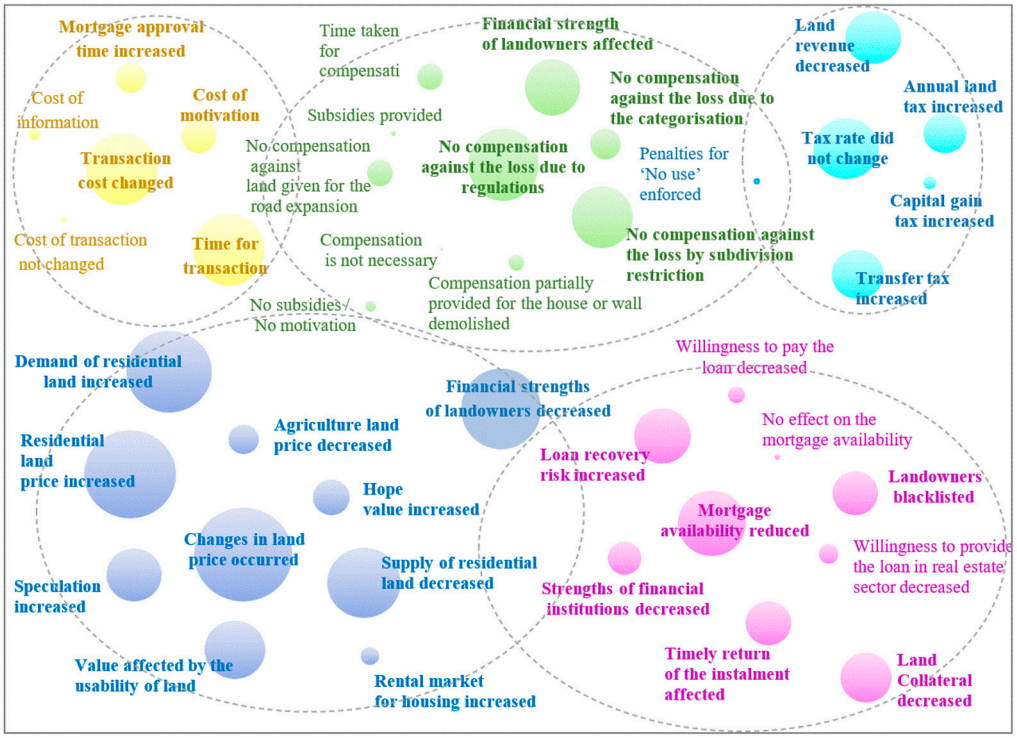

Figure 5. Segregated clusters of responses across the economic dimension.

Three significant clusters of responses were found across the social dimension: awareness of land use regulation, particularly subdivision restriction and land classification; failure to meet social expectations; and distance to the workplace (Figure 6).

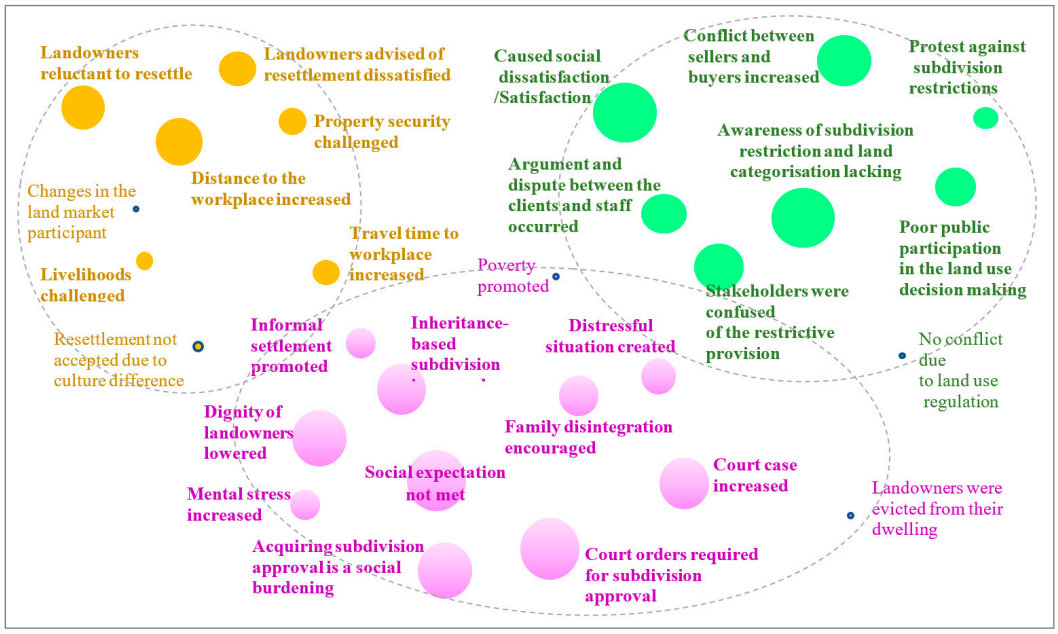

Figure 6. Segregated clusters of responses across the social dimension.

Three clusters of recurring responses were identified across the environmental dimension related to risk reduction, quality of residential land in planned areas, and haphazard or unplanned land use- size of the circle being proportional to the number of responses (Figure 7).

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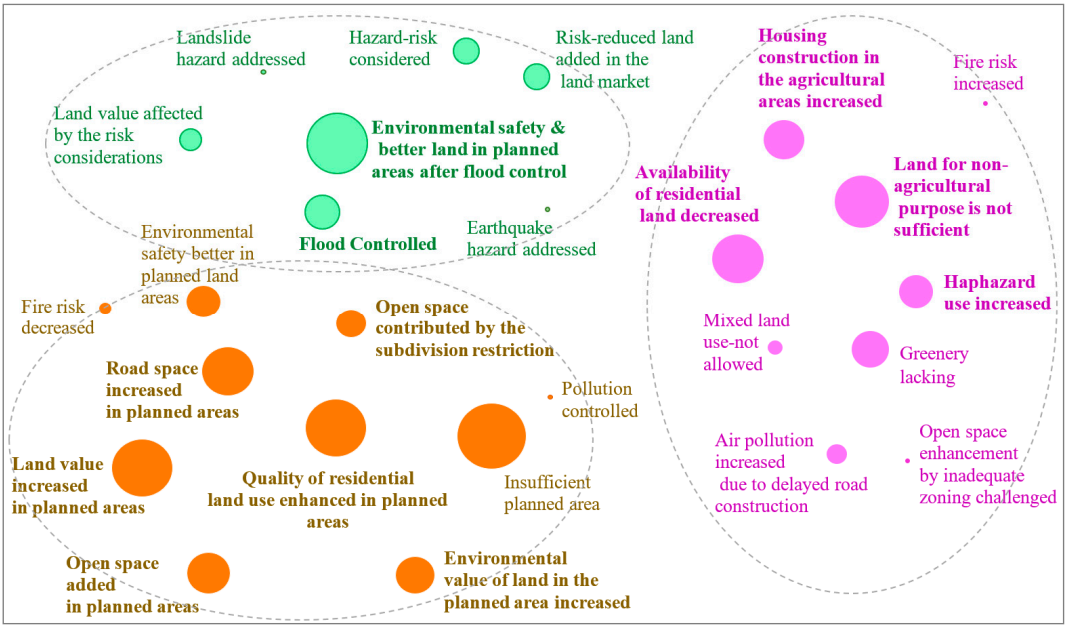

Figure 7. Segregated clusters of responses across the environmental dimension.

Across institutional dimension, respondents raised concerns about the property rights associated with the land (Figure 8) due to subdivision restriction, lot size control, and the absence of coordination mechanisms.

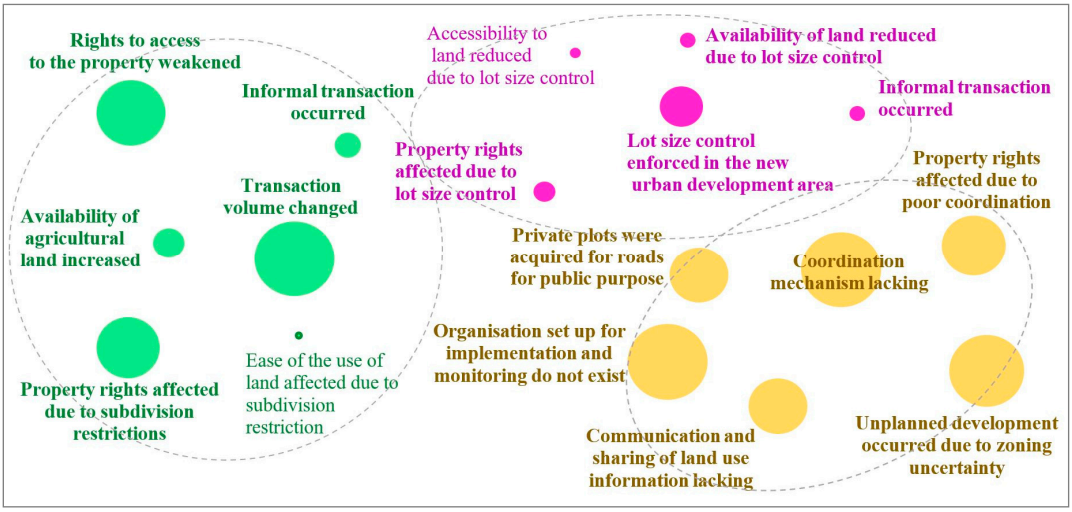

Figure 8. Segregated clusters of responses across **the** institutional dimension**.**

4.3. Refinement of Land Market Impact Factors

The impact factors identified through the literature (Figure 2) and those recurring in the interview data from this study (Figures 5–8) were reviewed for their similarity. To arrive at a standard set of impact factors, those which were similar or repeated were reclassified and allocated to economic, environmental, social and institutional dimensions based on their relevance to the Nepalese land market (Table 3).

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Table 3. Impact issues identified from the desktop review and interview.

Dimension	Preliminary impact factors from desk review	Key theme from the interview	Refined Impact Factor	Impact indicators relevant to the Nepalese land market based on the interview responses
Economic	Transaction cost	Changes in the transaction cost occurred	Transaction cost	Changes in the cost of the transaction
				Changes in the time of transaction
	Valuation	Changes in land value or price occurred differently	Valuation	Changes in the price of residential land
				Changes in the price of agricultural land
				Price speculation due to land categorization or subdivision restriction
	Mortgage availability	Mortgage availability reduced by the land use regulation	Mortgage availability	Accessibility of land property as collateral
				Number of blacklisted landowners
				Changes in the financial strength of the financial institutions
				Number of landowners who received loans from financial institutions
	Taxation	Changes in taxation occurred	Taxation	Changes in land tax
				Penalties for no use of the land
	Compensation	There was inadequate compensation to landowners for the loss due to land use regulation	Compensation	Sufficiency of the compensation paid for loss due to subdivision restriction
				Sufficiency of compensation for loss due to road expansion
				Time required for the payment of compensation
Social	Willingness & Acceptance	Low level of awareness of land use regulation created conflict between stakeholders	Awareness	Conflict between sellers and buyers due to lack of awareness of land use regulation
				Dispute between clients and staff over the failure of parcel subdivision
	Expectation	Social expectations not met, as revealed by the court cases for subdivision approval	Expectation	Ease of the subdivision approval process
				Number of court order cases for subdivision approval
	Proximity	Landowners dissatisfied with the allocation of resettlement	Proximity	Satisfaction of landowners due to distance to the workplace
				Satisfaction of landowners due to travel time to the workplace

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Dimension	Preliminary impact factors from desk review	Key theme from the interview	Refined Impact Factor	Impact indicators relevant to the Nepalese land market based on the interview responses
				Changes in the number of landowners/buyers in the land market
Environmental	Risk reduction	Risk considerations in land use planning changed supply and value in the land market	Risk reduction	Changes in the area at risk of flooding in the Kathmandu Valley
				Changes in the supply of flood-safe plots in the Kathmandu Valley
	Quality of residential land	Changes in the quality of residential land made a difference in the land market by changing the value and supply of such land	**Quality of residential land**	Supply of residential land with added open space in land pooling areas
				Change in the supply of residential land with added enhanced road and utility infrastructure
				Change in the land value of quality residential plots compared to surrounding unplanned areas
	Suitability of zoning classification	Inadequate classification did not address the land requirement and promoted haphazard use	**Suitability of zoning classification**	Sufficiency of land allocated for non-agricultural purpose
				Changes in the amount of housing construction in agricultural land of the Kathmandu Valley
Institutional	Lot size	Lot size affected the availability of land and accessibility to land rights	**Lot size**	Number of available parcels qualified for the market transaction
				Changes in the number of transactions of parcels bigger than the threshold size
				Changes in the accessibility to land rights
	Rights on land / Subdivision restrictions	Subdivision restriction affected the availability of land and accessibility to land rights	**Subdivision restrictions**	Changes in the amount (count) of parcels subdivided
				Access to the adjoining parcel to use for road purposes (ease of the use of land)
				Number of informal transactions
	Coordination	Poor coordination mechanism affected property rights	**Coordination**	Number of private lots taken partly by the road expansion
				Number of court cases registered against the KVDA to secure property rights

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5. Discussion

There was general consensus on categorization of impact factors across the four dimensions, except for two factors within the social dimension: 'willingness' and 'acceptance'. A refined factor, 'awareness', was therefore introduced in the refined list. The decision to exclude 'willingness' and 'acceptance' from the list of initially identified impact factors stemmed from considering these elements as prerequisites for social dimension in land use planning and, therefore, not suitable for inclusion. Instead, the success of land use planning and its influence on the land market relies on stakeholders' level of awareness and the extent to which social expectations are met by the regulations. Similarly, among the four initially identified impact factors within the institutional dimension (Figure 8), the issue of property rights was observed as an outcome of lot size control, subdivision restrictions, and coordination. Consequently, it was treated as an indicator rather than an independent impact factor.

The findings indicate that the impact on a land market cannot be fully captured within a single economic dimension, as suggested by Needham, Segeren and Buitelaar [5] and as underscored by the three-pillar model of the land market [36], which encompasses multiple components.

The primary function of the land market is to facilitate the transfer of rights in land, and any changes within the land market model's components can affect this process. While factors like land valuation and mortgage availability directly relate to the two pillars of the land market model, changes in these aspects primarily impact the economic dimension of the land market. However, the introduction of land use regulation in Nepal extends beyond these pillars. The restrictive regulations affected participants through increases in transaction costs and transfer taxes. Nepalese land market participants also suffered financial losses when restrictions were imposed on landowners without compensating them for their losses, a significant factor highlighted by several authors [21,57].

Stakeholders highlighted that subdivision restrictions led to an exacerbation of social disparities among land market participants and posed risks of social disintegration, resulting in conflicts and legal disputes. Additionally, social findings revealed that stakeholders engaged in the land market at a social cost, evidenced by the rise in parcel subdivision due to court orders, family inheritance issues, and divorce proceedings. These outcomes the findings of Deininger [58] that the land policy implementation outcomes needs to be assessed whether they are socially desirable or not.

Stakeholders observed that environmental considerations in land use planning have had notable impacts on the Nepalese land market. The Land Use Policy 2015 introduced 'land pooling' as an alternative to traditional subdivision control methods, to supply safer and value-added residential service plots. This approach, characterized by larger areas of open space and improved utility services, was perceived as providing better quality residential land with higher environmental value, implicitly enhancing the land's overall value, which is also highlighted by Faust, Castro-Wooldridge, Chitrakar and Pradhan [96]. Furthermore, risk-based land use planning in Nepal has offered an opportunity to go beyond merely planning for natural hazards, as emphasized by Saunders and Kilvington [98]. Conversely, poor land zoning has had adverse effects on land supply and has also resulted in stagnant land values. In the Kathmandu Valley, inappropriate zoning of the majority of land as agricultural, coupled with restrictions, has led to a reduction in residential land supply and has encouraged haphazard development due to a scarcity of land available for housing.

6. Conclusions

This study identifies that the introduction of land use regulation in Nepal has had a multi-dimensional impact on the Nepalese land market, as perceived by stakeholders in the land market. This aligns with previous findings from literature- that emphasizes the assessment of the land market across various dimensions. Fourteen land market impact factors associated with the implementation of land use regulation in Nepal were identified, spanning economic, social, environmental, and institutional dimensions.

Within the economic dimension, factors such as transaction costs, valuation, mortgage availability, taxation, and compensation were highlighted. Institutional factors included lot size, subdivision restrictions, and coordination. Social dimension factors encompassed awareness,

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expectation, and proximity, while environmental factors included risk reduction, quality of residential land, and suitability of zoning classification.

These perspective-based impact factors coincide with those identified in the literature, suggesting their relevance in comprehensively assessing the land market across multiple dimensions. The diversity of these impact factors underscores the need for a holistic approach to land market assessment, as relying solely on economic theory may not capture the full extent of the land market's complexity.

However, quantifying the impact of these diverse factors presents a challenge. Further research is required to an develop integrated framework for measuring the impacts of land use regulation by incorporating these identified factors. This would facilitate a more nuanced understanding of the depth and direction of the impact of land use policy interventions on the Nepalese land market. This study has contributed to a refined set of land market impact factors in the context of introduction of land use regulation in Nepal. However, these factors and associated dimension may also be applied and generalized to other developing economies. The outputs from this study will assist implementing agencies in identifying the associated issues that need to be considered for the successful implementation of land use regulation and establishing an efficient and effective land market in Nepal.

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Data Availability Statement: Due to privacy or ethical restrictions, raw data used in this study cannot be made available a statement is still required.

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